Rev Soc Bras Med Trop 51(2):203-206, March-April, 2018
doi: 10.1590/0037-8682-0093-2017

Short Communication

Prevalence of hypoalbuminemia in outpatients with HIV/AIDS

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Abstract

Introduction: Hypoalbuminemia may predict progression of disease and mortality in patients with human immunodeficiency virus (HIV) infection/acquired immune deficiency syndrome (AIDS). This study was conducted to investigate the risk factors associated with hypoalbuminemia in outpatients with HIV/AIDS. **Methods:** A cross-sectional study was performed in 196 outpatients with HIV/AIDS. **Results:** The prevalence of hypoalbuminemia was 11.7%. The only risk factor associated with hypoalbuminemia was current antiretroviral therapy (no exposure: odds ratio=3.46, 95% confidence interval=1.20–10.02). **Conclusions:** The monitoring of plasma albumin is key to determine when antiretroviral therapy should be initiated in individuals not exposed to antiretroviral medicines.

Keywords: HIV. Albumin. Antiretroviral therapy.

During acute-phase responses resulting from infection or trauma, there are wide ranges of pathophysiological responses including the reduction in serum albumin levels. Reductions in serum albumin levels are attributed to increasing levels of inflammatory biomarkers, such as tumor necrosis factor (TNF) and interleukin-6 (IL-6), which are responsible for reductions in hepatic albumin synthesis and increases in albumin leakage to the extravascular space, while enhancing the degradation of albumin[1,2].

Several studies involving patients infected with human immunodeficiency virus (HIV) have determined that hypoalbuminemia (defined as serum albumin concentrations <3.5g/dL) is associated with more rapid progression to acquired immune deficiency syndrome (AIDS) and mortality[3-5].

The aims of this cross-sectional study were to determine the prevalence and investigate the risk factors associated with hypoalbuminemia in outpatients with HIV/AIDS.

This transversal study was performed on adult outpatients infected with HIV in the Eduardo de Menezes Hospital, Hospital Foundation of Minas Gerais, Belo Horizonte, Minas Gerais, Brazil. The sample size was calculated based on the total number of outpatients infected with HIV (n=1,400) who regularly attended the Infectious Diseases Service of the Hospital Eduardo de Menezes-HEM da Fundação Hospitalar do Estado de Minas Gerais-FHEMIG. The prevalence of hypoalbuminemia in patients infected with HIV ranged from 5.9% to 39.5%[6-8]. The sample number was calculated based on a hypoalbuminemia prevalence of 50%, with a range of 8% at a 95% confidence level. A minimum sample of 136 was obtained. The study included patients infected with HIV who were older than 18 years of age and agreed to participate in the research through the signing of a free and informed consent agreement. Pregnant women with HIV were excluded. The outpatients with HIV in this study were selected after drawing among those who were booked on the day for an appointment at the HEM. All the selected subjects agreed to participate and had their data collected.

A single researcher performed data collection. Atenrollment, clinical information, and demographic and anthropometric characteristics were obtained. Laboratory test results [cluster of differentiation (CD) 4 cell counts, viral load, albumin, and total protein] were collected from the medical records. Blood samples were collected after undergoing a 12-hour fast.

Counting of CD4 cells was performed by the Laboratory of the *Fundação Ezequiel Dias*, Belo Horizonte, Minas Gerais; other biochemical tests were performed by the Clinical Analysis Laboratory of the HEM/FHEMIG. CD4+ T-cell counts were obtained using flow cytometry. Viral load was determined

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Received 25 April 2017
Accepted 10 October 2017

TABLE 1: Characteristics of outpatients infected with HIV stratified by gender.

Characteristics	Total	Men	Women	
	n (%)	n (%)	n (%)	p-value
Age (years) (n=196)				
<40	91 (46.4)	66 (49.6)	25 (39.7)	
≥40	105 (53.6)	67 (50.4)	38 (60.3)	0.19
BMI (kg/m^2) (n=194)				
<18.5	16 (8.2)	9 (6.8)	7 (11.3)	
18.5-24.9	115 (59.3)	84 (63.6)	31 (50.0)	
≥25	63 (32.5)	39 (29.6)	24 (38.7)	0.18
Duration of HIV infection (years) (n=196)				
<6	103 (52.6)	71 (53.4)	32 (50.8)	
≥6	93 (47.4)	62 (46.6)	31 (49.2)	0.74
Current antiretroviral therapy (n=196)				
no	22 (11.2)	9 (6.8)	13 (20.6)	
yes	174 (88.8)	124 (93.2)	48 (79.4)	<0.05
Duration of antiretroviral therapy (years) (n=174)				
<5	85 (48.8)	63 (50.8)	22 (44.0)	
≥5	89 (51.2)	61 (49.2)	28 (56.0)	0.42
CD4 cell count (cells/mm^3) (n=196)				
<200	21 (10.7)	13 (9.7)	8 (12.7)	
200-499	94 (48.0)	69 (51.9)	25 (39.7)	
≥500	81 (41.3)	51 (38.4)	30 (47.6)	0.28
Albumin (g/dL) (n=196)				
<3.5	23 (11.7)	14 (10.5)	9 (14.3)	
≥3.5	173 (88.3)	119 (84.5)	54 (85.7)	0.44

HIV: human immunodeficiency virus; **BMI:** body mass index; **CD4:** cluster of differentiation 4.

using the Versant® HIV 1 RNA 3.0 (bDNA) (Bayer®, Tarrytown, NY, USA) test, with a detection limit threshold of 50 copies/mL of plasma. Plasma levels of total protein and albumin were analyzed enzymatically using a colorimetric assay (Vitros Chemistry Products, Johnson & Johnson Clinical Diagnostics®, Rochester, USA). Hypoalbuminemia was defined by plasma levels of albumin <3.5g/dL[7].

All procedures for obtaining anthropometric measurements were carried out in accordance with standardized criteria[9]. Height was measured using a wall-mounted wooden stadiometer. Weight was measured using a mechanical weighing scale (Filizola®, Filizola S.A. Pesagem e Automação, São Paulo, SP, Brazil), with a maximum capacity of 150kg and precision of 100g. Body mass index (BMI) was calculated by dividing the current body weight (kg) by the square of the height (m^2)[9]. According to BMI, patients were classified as underweight (BMI <18.5kg/m^2), normal weight (BMI between 18.5 and 24.99 kg/m^2), or overweight (BMI ≥25 kg/m^2)[9].

Data analysis was carried out with Stata software, version 10.0, at a 5% significance level. Continuous variables with temporal information on infection diagnosis, antiretroviral therapy exposure and age were categorized using the median as the cutoff point. Categorical variables were described through frequencies and compared using the Chi-square test or Fisher's exact test.

The Shapiro–Wilk test was used to evaluate the normality of continuous variables. Age was also presented as means and standard deviations (SD). To compare age by gender, the Student's *t* test was used. A logistic regression model was used to evaluate the association between hypoalbuminemia and other

TABLE 2: Odds ratios of characteristics associated with hypoalbuminemia.

Characteristics	Total	Hypoalbuminemia		Odds ratio (95% CI)
	N	no	yes	
Gender				
male	133	119	14	1
female	63	54	9	1.42 (0.57–3.47)
Age (years)				
<40	91	81	10	1
≥40	105	92	13	1.14 (0.48–2.75)
BMI (kg/m^2)				
18.5-24.9	115	99	16	1
<18.5	16	13	3	1.43 (0.36–5.57)
≥25	63	60	3	0.31 (0.09–1.11)
Duration of HIV infection (years)				
<6	103	91	12	1
≥6	93	82	11	1.02 (0.42–2.43)
Current antiretroviral therapy				
yes	174	157	17	1
no	22	16	6	3.46 (1.20–10.02)
Duration of antiretroviral therapy (years) (n=174)				
<5	85	75	10	1
≥5	89	82	7	0.64 (0.23–1.77)
Without antiretroviral therapy	22	16	6	2.81 (0.89–8.86)
CD4 cell count (cells/mm^3)				
≥500	81	73	8	1
<200	21	17	4	2.15 (0.58–7.97)
200-499	94	83	11	1.21 (0.46–3.17)

N: number; **CI:** confidence interval; **BMI:** body mass index; **HIV:** human immunodeficiency virus; **CD4:** cluster of differentiation 4.

investigated characteristics. The strength of the association was measured through the odds ratio (OR) with 95% confidence intervals (CIs). The variables that presented p-values <0.25 in the univariate logistic regression analysis were selected for final model construction. Goodness-of-fit was verified using the Hosmer-Lemeshow statistics method.

Among the 196 outpatients infected with HIV, the male gender comprised 67.9%. The mean ages of men and women infected with HIV were 41.1 (7.6) years and 42.4 (9.4) years, respectively (p-value=0.31). The proportion of individuals exposed to antiretroviral therapy was higher among men, as shown in **Table 1**. The overall prevalence of hypoalbuminemia was 11.7%. **Table 2** shows the results of ORs for characteristics associated with hypoalbuminemia. The variables selected for final logistic regression model construction for hypoalbuminemia were duration of antiretroviral therapy, current antiretroviral therapy, and BMI. In the final logistic regression model, the only risk factor associated with hypoalbuminemia was current antiretroviral therapy (no exposure: OR=3.46, 95% CI=1.20-10.02).

In this study, we noted that the prevalence of hypoalbuminemia among outpatients infected with HIV was 11.7%. The factor associated with hypoalbuminemia was current exposure to antiretroviral therapy. The risk for hypoalbuminemia was greater among patients not exposed to antiretroviral therapy.

In previously reported studies, the prevalence of hypoalbuminemia varied from 5.9% to 39.5%[6-8,10]. This variation may be linked to factors that could influence the serum albumin

levels, such as nutritional status, inflammatory response, renal function, hepatic function, and enteropathy[11]. The prevalence of hypoalbuminemia observed in this study (11.7%) can be explained by the fact that we evaluated albumin levels in a group of patients extensively exposed to antiretroviral therapy; therefore, these patients presented better immunological conditions than non-exposed patients.

Non-exposure to antiretroviral therapy as a risk factor for hypoalbuminemia may be a proxy variable that contains information about increased control of HIV infection[6,12,13].

The main limitations of this cross-sectional study on identifying risk factors are the temporal bias, because the time sequence cannot be established, and the survival bias, both of which may affect prevalence.

This study shows that the monitoring of plasma albumin is key to determine when antiretroviral therapy should be initiated in individuals who are not exposed to antiretroviral medicines.

Ethical considerations

This study was approved by the Ethical Review Board of the Federal University of Minas Gerais (N. 0563.0.203.000-09).

Acknowledgments

We offer our deepest thanks to the institutions that provided technical support for the development and implementation of this study.

Conflict of interest

The authors declare that there is no conflict of interest.

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